

## TITLE OF THE INVENTION

### BREAD MAKER AND METHOD OF CONTROLLING THE SAME

## CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This application claims the benefit of Korean Patent Application No. 2003-29066, filed May 7, 2003, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

**[0002]** The present invention relates to a bread maker and a method of controlling the same, and more particularly, to a bread maker and a method of controlling the same, which suspends heaters and kneading drums when a door is open while the bread maker operates, thereby increasing safety and decreasing loss of heat and electrical energy.

### 2. Description of the Related Art

**[0003]** Generally, a bread maker automatically performs kneading, leavening, and baking of bread dough, and provides fresh bread to a user, so that a user only needs to put ingredients in the bread maker. For example, a bread maker disclosed in Korean Patent First Publication No. 1988-7000638 includes a pair of parallel kneading drums at upper and lower parts of an oven compartment that reverse rotary direction periodically, a baking tray between the pair of kneading drums, a heater heating the inside of the oven compartment, a bar code reader, etc.

**[0004]** In the bread maker, upper and lower ends of a mixing bag filled with flour, water, etc., are attached to the upper and lower kneading drums, and then the mixing bag is reciprocated up and down for a predetermined period of time, thereby kneading the dough in the mixing bag.

**[0005]** After completing the kneading of the dough, the mixing bag is automatically separated from the upper kneading drum, and wound on the lower kneading drum, with the dough being squeezed out of the mixing bag and into the baking tray. Thereafter, the heater heats the inside of the oven compartment, thereby leavening and baking the dough for a predetermined period of time.

**[0006]** The bread is made according to a bar code that is printed on or applied to the mixing bag that includes information on kneading time, leavening time, baking time, etc., for a particular recipe. That is, the bar code is read by the bar code reader and the read data are transmitted to a controller, so that the controller controls the kneading drums, the heater, etc., on the basis of the read data.

**[0007]** However, in the conventional bread maker, while the bread is baked, when a user such as children or older persons carelessly opens a door without becoming aware that the bread is being baked, the heater is being continuously operated. In this case, even if the heater is being continuously operated, the bread is not completely baked after a lapse of a predetermined period of time because heat goes out of the oven compartment, thereby wasting heat energy. Further, at this time, the heater is not properly controlled, so that the bread may be burned according as the dough excessively rises and contacts the heater.

**[0008]** Further, when the door is open while the bread maker operates, children or older persons are likely to not become aware that the kneading drums rotate and the heaters operate, so that a user is in danger.

#### SUMMARY OF THE INVENTION

**[0009]** Accordingly, it is an aspect of the present invention to provide a bread maker and a method of controlling the same, which suspends heaters and kneading drums when a door is open while the bread maker operates, thereby increasing safety and decreasing loss of heat and electrical energy.

**[0010]** Additional and/or other aspects and advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0011]** These and/or other aspects and advantages of the present invention will become apparent and more readily appreciated from the following description of the preferred embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a perspective view of a bread maker according to an embodiment of the present invention;

FIG. 2 is a cut open perspective view of a component compartment of FIG. 1;

FIG. 3 is a control block diagram of the bread maker according to an embodiment of the present invention; and

FIG. 4 is a control flowchart of the bread maker according to an embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0012]** Reference will now be made in detail to the present preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present invention by referring to the figures.

**[0013]** As shown in FIG. 1, a bread maker 1 according to the present invention comprises a main body 3 having an oven compartment 10 and a component compartment 30, a door 5 provided in the front of the main body 1 to open and close a front opening of the oven compartment 10, an operation selecting part 7 provided in a front side of the main body 3 and allowing a user to select an operation of the bread maker 1, and a display part 9 displaying an operating state of the bread maker 1.

**[0014]** In upper and lower parts of the oven compartment 10 are provided an upper kneading drum 12a and a lower kneading drum 12b, which are disposed in parallel and alternate clockwise and counterclockwise rotations. On the upper and lower kneading drums 12a and 12b are wound opposite ends of a mixing bag (not shown) filled with ingredients for the bread, respectively. Each kneading drum 12a and 12b has a plurality of holding projections 16 protruding along a lengthwise direction thereof to hold the opposite ends of a mixing bag, so that the mixing bag can be attached to the kneading drums 12a and 12b.

**[0015]** In a lower part of the oven compartment 10, there is a baking tray 22 in which the kneaded dough is baked between the upper and lower kneading drums 12a and 12b. The baking tray 22 includes a first tray 22a and a second tray 22b, each having an "L"-shaped section symmetrical to one another that combine into a box shape having an open top.

**[0016]** In an upper part of the oven compartment 10, a pair of dough-blocking members 18 is provided between the upper kneading drum 12a and the baking tray 12b to knead the dough contained in the mixing bag within the baking tray 22, preventing the dough from moving outside the baking tray 22.

**[0017]** At upper and lower parts of the inside walls of the oven compartment 10 and the door 5 are provided heaters 20 to heat the inside of the oven compartment 10.

**[0018]** The component compartment 30 includes a first component compartment 28 placed beside the oven compartment 10 and a second component compartment 26 placed behind the oven compartment 10. As shown in FIG. 2, inside the first component compartment 28 is provided a drum driver 36 that rotates the upper and lower kneading drums 12a and 12b in clockwise and counterclockwise directions. Inside the second component compartment 26 is provided a bar code reader 24 that reads a bar code printed on or applied to the mixing bag that is wound on the upper and lower kneading drums 12a and 12b.

**[0019]** The drum driver 36 includes a motor 34 that rotates the lower kneading drum 12b, and a belt 32 that transmits a rotary movement of the lower kneading drum 13 to a rotation shaft 38 of the upper kneading drum 12a. The bar code reader 24 may move near to, and distantly from, an outer circumference of the upper kneading drum 12b.

**[0020]** On the other hand, the bread maker 1 according to the present invention comprises a rotation sensing part 40 to sense rotation of at least one of the upper and lower kneading drums 12a and 12b.

**[0021]** The rotation sensing part 40 includes a disk part 42 attached to the rotation shaft 38 of the upper kneading drum 12a, and a rotation sensor 44 placed near the disk part 42 that outputs a pulse signal by sensing the rotation of the disk part 42.

**[0022]** The disk part 42 includes a first disk 46 that allows the rotation sensor 44 to sense one revolution of the upper kneading drum 12a, and a second disk 48 that allows the rotation sensor 44 to sense a rotation of the upper kneading drum 12a that is less than one complete turn.

**[0023]** The rotation sensor 44 is used as a pulse generator, and includes light emitting parts that emit a sensing signal such as infrared rays toward the first and second disks 46 and 48,

and light receiving parts that face the light emitting parts, respectively, across the first and second disks 46 and 48 and receive the light emitted from the light emitting parts, respectively.

**[0024]** The sensing signal emitted from the light emitting part to the light receiving part is interrupted according as the upper kneading drum 12a rotates, so that the pulse signal is output in a cycle of one complete turn of the upper kneading drum 12a.

**[0025]** It is understood that the rotation sensing part 40 may also comprise a single rotation disc as a circular shaped member and having convex sections and concave sections in the circumference, and a rotation signal sensor having a radiating part and a signal sensing part provided in parallel with the rotation disc interposed therebetween.

**[0026]** The pulse signal is transmitted from the rotation sensor 44 to a controller 56 (to be described later), and then the controller 56 determines a rotated position of the upper kneading drum 12a based upon the pulse signals and controls the drum driver 36 to rotate the upper and lower kneading drums 12a and 12b, thereby adjusting a reciprocating distance of the mixing bag.

**[0027]** As shown in FIG. 3, the bread maker 1 according to the present invention further comprises a door sensor 54 to sense whether the door 5 is open or closed, a timer 52 to count elapsed time, a heater driver 50 to turn on the heaters 20, and the controller 56 to control the door sensor 54, the timer 52 and the heater driver 50.

**[0028]** The door sensor 54 is preferably a switch interlocked with opening and closing of the door 5, and therefore outputs a signal to the controller 56 in response to the opening and closing of the door 5.

**[0029]** The timer 52 counts the time elapsed since the door 5 is opened, and transmits counted time information to the controller 56.

**[0030]** The controller 56 controls the drum driver 36 to turn on the motor 34 to partially wind the mixing bag attached to the kneading drums 12 on the kneading drum 12 when a user selects a bar code reading operation through the operation selecting part 7. As the mixing bag is wound on the kneading drum 12, the bar code reader 24 reads the bar code printed or applied on the mixing bag. On the basis of the bar code that includes information on kneading time, leavening time, leavening temperature, baking time, baking temperature, etc., for a

particular recipe, which is read by the bar code reader 24, the controller 72 controls the drum driver 36 to rotate the kneading drums 12 so as to knead the dough contained in the mixing bag, and controls a heater driver 70 to turn on the heaters 20 so as to leaven and bake the dough.

**[0031]** When the controller 56 determines that the door 5 is open while the bread maker 1 operates based on the signal from the door sensor 54, the controller 56 controls the drum driver 36 and the heater driver 70 to respectively suspend the kneading drum 12 and the heater 20. At the same time, the controller 56 controls the display part 9 to display a message warning a user that the door 5 is open. Hence, when the door 5 is open while the bread maker operates, the kneading drum 12 and the heater 20 are suspended, thereby increasing safety and decreasing loss of heat and electrical energy.

**[0032]** In the above-described embodiment, the display part 9 is employed to display the message to warn a user that the door 5 is open. However, to warn a user that the door 5 is open, a buzzing sound may be used with or without the display part 9. In this case, the bread maker 1 comprises a sound circuit and a speaker, and the controller 56 controls the sound circuit to make the buzzing sound through the speaker, thereby warning a user that the door 5 is open.

**[0033]** Further, when the controller 56 determines that a predetermined time elapses since the door 5 is opened based on the counted time information from the timer 52, the controller 56 controls the heater driver 50 and the drum driver 36 to stop the heaters 20 and the kneading drum 12. At this time, if it is determined that the mixing bag is wound on the kneading drums 12, the controller 56 controls the mixing bag to be released from the kneading drums 12. That is, the controller 56 controls the lower kneading drum 12b to rotate in a direction of releasing the lower end of the mixing bag from the lower kneading drum 12b, and then controls the upper kneading drum 12a to rotate to an initial holding position allowing a user to readily remove the upper end of the mixing bag from the upper kneading drum 12a. Thus, the bread maker is stopped and returned to an initial state. Further, a warning message of the predetermined time out is displayed on the display part 9, thereby letting a user know that the bread maker 1 is stopped. Additionally, a buzzing sound may be made by a speaker with or without the warning message of the display part 9.

**[0034]** Further, when the controller 56 determines that the door 5 is closed within the predetermined time elapsed after the door 5 is opened on the basis of the counted time information from the timer 52 and the signals from the door sensor 54, the controller 56 controls the heater driver 50 and the drum driver 36 to restart the heaters 20 and the kneading drum 12.

**[0035]** Here, the controller 56 comprises a memory to store information on the rotated position of the kneading drum 12 sensed by the rotation sensing part 40 when the kneading drum 12 is suspended. Therefore, when the controller 56 determines that the door 5 is closed, the controller 56 controls the drum driver 36 to restart the kneading drum 12 from the rotated position based on the information stored in the memory.

**[0036]** Further, in a normal state, the heater 20 is continuously operated during a predetermined period of heating time. However, the predetermined period of heating time goes on even though the heater 20 is suspended while the door 5 is open, so that the heating time for the bread is shortened and the bread is not completely baked. Thus, the controller 56 controls the operating time of the heater 20 to be prolonged as long as the time that the door 5 is open.

**[0037]** As shown in FIG. 4, the bread maker 1 according to the present invention operates as follows. At operation 100, the mixing bag is wound on the kneading drum 12 so as to allow the bar code reader 24 to read the bar code printed or applied on the mixing bag. At operation 122, the controller 56 receives the read data from the bar code reader 24. At operation 144, the controller 56 controls the drum driver 36 and the heater driver 70 to drive the kneading drum 12 and the heater 20 to knead and bake the dough, respectively.

**[0038]** At operation 166, the controller 56 determines whether the door 5 is open or closed on the basis of the signal from the door sensor 54 while the dough is kneaded or baked. When the controller 56 determines that the door 5 is open, the controller 56, at operation 188, respectively controls the drum driver 36 and the heater driver 50 to suspend the kneading drum 12 and the heater 20, and, at operation 200, controls the display part 9 to display a message warning a user that the door 5 is open.

**[0039]** At operation 222, the controller 56 determines whether or not the predetermined time elapses since the door 5 is opened on the basis of the counted time information from the timer 52. When the controller 56 determines that the predetermined time elapses since the door 5 is opened, at operation 266, the controller 56 controls the kneading drum 12 to rotate in a direction

of releasing the mixing bag from the kneading drums 12, controls the heater driver 50 and the drum driver 36 to stop the heaters 20 and the kneading drum 12, and controls the display part 9 to display the warning message of the predetermined time out.

**[0040]** At operation 244, the controller 56 determines whether or not the door 5 is closed within the predetermined time elapsed after the door 5 is opened on the basis of the counted time information from the timer 52 and the signals from the door sensor 54. When the controller 56 determines that the door 5 is closed within the predetermined time, the controller 56 controls the heater driver 50 and the drum driver 36 to restart the heaters 20 and the kneading drum 12, respectively 288. The restarted heaters 20 and the kneading drum 12 then operate until the interrupted bread making process is completed by taking into account the time remaining in the bread making process and any negative effects of the interruption.

**[0041]** As described above, the present invention provides a bread maker and a method of controlling the same, which can suspend heaters and kneading drums when a door is open while the bread maker operates, thereby increasing safety and decreasing loss of heat and electrical energy.

**[0042]** Although a few embodiments of the present invention have been shown and described, it will be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the appended claims and their equivalents.